Claims

We claim:

1. A method for quantizing an input signal including N samples into a string of k symbols selected from a q-ary alphabet, comprising:

selecting an $[N,k]_q$ linear block error-correcting code having a sparse factor graph representation;

determining a cost function for the input signal using a selected mapping function from the symbols to the samples and a predetermined distortion measure; and

decoding the cost function to an information block corresponding to a code word of the linear block error-correcting code, the code word having a low distortion cost, and the information block including the string of k symbols.

2. The method of claim 1, in which the code is an $[N, k]_q$ sparse generator factor graph code.

3. The method of claim 1, in which the code is a low-density generator matrix code.

4. The method of claim 1, in which the decoder is a soft-input decoding method.

5. The method of claim 1, in which the decoder is a belief propagation decoding method.

6. The method of claim 1, wherein the decoder is a bit-flipping decoding method.

7. The method of claim 1, further comprising a method for reproducing a minimally distorted version of the input signal from the string of k symbols, comprising:

encoding the string of k symbols into a reproduced code word of the code; and

replacing symbols of the reproduced code word with samples according to the selected mapping function.

8. The method of claim 7, in which the encoding method is the belief propagation with hard messages for the sparse factor generator graph representing the code.